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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XF870

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Service Pier Extension Project on Naval Base Kitsap Bangor, Washington

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an incidental harassment authorization (IHA) to the United States Department of the Navy (Navy) to incidentally harass, by Level A and Level B harassment, marine mammals during construction activities associated with the Service Pier Extension (SPE) project at Naval Base Kitsap Bangor, Washington.

DATES: This Authorization is effective from July 16, 2019 through July 15, 2020.

FOR FURTHER INFORMATION CONTACT: Rob Pauline, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at:

www.nmfs.noaa.gov/pr/permits/incidental/construction.htm. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant), and if the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth.

NMFS has defined “negligible impact” in 50 CFR 216.103 as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

The MMPA states that the term “take” means to harass, hunt, capture, kill or attempt to harass, hunt, capture, or kill any marine mammal.

Except with respect to certain activities not pertinent here, the MMPA defines “harassment” as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Summary of Request

On August 9, 2017, NMFS received a request from the Navy for an IHA to take marine mammals incidental to pile driving and removal associated with planned construction of the SPE on Naval Base Kitsap Bangor, Washington. The application was deemed adequate and complete by NMFS on November 15, 2017.

The Navy's request is for take by Level B harassment of four marine mammal species and Level A and Level B harassment of one species. Neither the Navy nor NMFS expect serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

Description of Planned Activity

Overview

The Navy is planning to extend the service pier to provide additional berthing capacity and improve associated facilities for existing homeported and visiting submarines at Naval Base Kitsap Bangor. The project includes impact and vibratory pile driving and vibratory pile removal. Sounds resulting from pile driving and removal may result in the incidental take of marine mammals by Level A and Level B harassment in the form of auditory injury or behavioral harassment. Naval Base Kitsap Bangor is located on Hood Canal approximately 20 miles (32 kilometers) west of Seattle, Washington. The in-water construction period for the planned action will occur over 12 months. The issued IHA would be effective from July 16, 2019 through July 15, 2020 and cover two in-water work windows. A detailed description of the planned SPE project is provided in the **Federal Register** notice for the proposed IHA (83 FR 10689; March 12, 2018). Since that time, no changes have been made to the planned pile driving and removal activities. Therefore, a detailed description is not provided here. Please refer to that **Federal Register** notice for the description of the specific activity.

Comments and Responses

A notice of NMFS's proposal to issue an IHA to the Navy was published in the **Federal Register** on March 12, 2018 (83 FR 10689). That notice described, in detail, the Navy's activity, the marine mammal species that may be affected by the activity, and the anticipated effects on marine mammals. During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission, Whale and Dolphin Conservation (WDC), and private citizens.

Comment: The Commission commented that the method NMFS used to estimate the numbers of takes during the proposed activities, which summed fractions of takes for each species across project days, does not account for and negates the intent of NMFS's 24-hour reset policy. The Commission understands that NMFS has developed rounding criteria and recommends that it be shared with the Commission.

Response: NMFS will share the rounding criteria with the Commission following the completion of internal review and looks forward to discussing the issue with them in the future.

Comment: The Commission requested clarification of certain issues associated with NMFS's notice that one-year renewals could be issued in certain limited circumstances and expressed concern that the renewal process, as proposed, would bypass the public notice and comment requirements. The Commission also suggested that NMFS should discuss the possibility of renewals through a more general route, such as a rulemaking, instead of notice in a specific authorization. The Commission further recommended that if NMFS did not pursue a more general route, that the agency provide the Commission and the public with a legal analysis supporting our conclusion that this process is consistent with the requirements of section 101(a)(5)(D) of the MMPA.

Response: The process of issuing a renewal IHA does not bypass the public notice and comment requirements of the MMPA. The notice of the proposed IHA expressly notifies the public that under certain, limited conditions an applicant could seek a renewal IHA for an additional year. The notice describes the conditions under which such a renewal request could be considered and expressly seeks public comment in the event such a renewal is sought. Importantly, such renewals would be limited to where the activities are identical or nearly identical to those analyzed in the proposed IHA, monitoring does not indicate impacts that were not previously analyzed and authorized, and the mitigation and monitoring requirements remain the same, all of which allow the public to comment on the appropriateness and effects of a renewal at the same time the public provides comments on the initial IHA. NMFS has, however, modified the language for future proposed IHAs to clarify that all IHAs, including renewal IHAs, are valid for no more than one year and that the agency would consider only one renewal for a project at this time. In addition, notice of issuance or denial of a renewal IHA would be published in the **Federal Register**, as are all IHAs. Last, NMFS will publish on our website a description of the renewal process before any renewal is issued utilizing the new process.

Comment: The Commission supports NMFS's use of the updated permanent threshold shift (PTS) thresholds and associated weighting functions that are used to estimate the Level A harassment zones. However, it feels there are some shortcomings that need to be addressed regarding the methodology for determining the extent of the Level A harassment zones based on the associated PTS cumulative sound exposure level (SEL_{cum}) thresholds for the various types of sound sources, including stationary sound sources. The Commission does not question the Level A harassment thresholds themselves, but rather the manner in which the PTS SEL_{cum} thresholds are currently implemented. The Level A and B harassment zones do not make sense biologically

or acoustically due to NMFS's unrealistic assumption that the animals remain stationary throughout the entire day of the activity. The Commission believes that it would be prudent for NMFS to consult with scientists and acousticians to determine the appropriate accumulation time that action proponents should use to determine the extent of the Level A harassment zones based on the associated PTS SEL_{cum} thresholds in such situations.

Response: During the 2016 Technical Guidance's recent review, in accordance with EO 13795, NMFS received comments from multiple Federal agencies, including the Commission, recommending the establishment a working group to investigate more realistic means of approximating the accumulation period associated with sound exposure beyond the default 24-h accumulation period. Based on these comments, NMFS will be convening a working group to re-evaluate implementation of the default 24-h accumulation period and investigate means for deriving more realistic accumulation periods.

Comment: The Commission recommended that NMFS encourage the Navy to reduce the sizes of its shutdown zones to ensure both that pinnipeds are sufficiently protected from Level A harassment and that the activities can be completed in an appropriate manner and within an appropriate timeframe.

Response: NMFS consulted with the Navy who concurred that a reduction in zone sizes were appropriate. Additional details may be found in the Mitigation section of this notice.

Comment: The WDC recommended that lead observers should be familiar with, or adequately trained on, the differences in appearance between southern resident and transient killer whales and be able to immediately report the presence of southern resident orcas should they enter or approach Hood Canal.

Response: The Navy reports that qualified monitors would be familiar with differences in appearance between resident and transient killer whales.

Comment: The WDC recommended that the Navy install a hydroacoustic system to detect the presence of marine mammals at or near the entrance to Hood Canal, in order to monitor for southern resident killer whales, which tend to be more vocally active than transient killer whales.

Response: NMFS does not believe that a hydroacoustic system is necessary since southern resident killer whales have not occurred in Hood Canal. Additionally, due to the use of Orca network, marine mammal monitoring measures, and the high amount of attention that Southern resident killer whale movements receive, NMFS is confident that the Navy will be able to detect southern resident killer whale presence near the Hood Canal Bridge.

Comment: A comment from the public stated that there is not enough scientific data available on hearing impairment in marine mammals resulting from the proposed activities to make any type of determination. They also felt that there is a lack of scientific understanding of the potential effects of the project on the species in the surrounding area and that too many assumptions were made by NMFS in the analysis.

Response: The Potential Impacts section of the notice of proposed IHA (83 FR 10689; March 12, 2018) described numerous studies that have examined the effects of underwater sound on marine mammal, as well as those in the Technical Guidance that was directly used to assess noise-induced hearing loss. While not all marine mammal species have been subject to studies examining hearing and impacts of noise on hearing, enough data has been collected to identify specific marine mammal hearing groups as not all marine mammals have equal hearing capabilities or susceptibility to noise-induced hearing loss. Current hearing data (collected via

direct behavioral and electrophysiological measurements) and predictions (based on inner ear morphology, modeling, behavior, vocalizations, or taxonomy) allow for individual species to be placed in specific hearing groups and develop composite audiograms for each hearing group. From composite audiograms, weighting functions associated with each hearing group, along with data on noise-induced hearing loss (i.e., acoustic thresholds), can be applied to predict the exposures at which animals could suffer permanent hearing impairment.

NMFS uses the best available science to make determinations on the potential impacts of underwater noise on marine mammals. When specific data on a given topic or variable is not available, NMFS must make assumptions in order to conduct an analysis. In many instances, such assumptions are based on scenarios or conditions that existed at locations where NMFS had previously issued incidental take authorizations.

Comment: A private citizen comment noted NMFS fails to specify the use of a hydraulic or an electrical hammer during pile driving, and that the determination, or meaningful “assumptions,” of how significantly marine mammals will be affected by frequency and amplitude cannot be successful if the variation between the two hammering techniques is not taken into account. NMFS also did not define or have set criteria for the term problematic geotechnical conditions.

Response: NMFS is unaware of any data indicating a difference in frequency and/or amplitude between hydraulic and electric hammers during pile driving. Problematic geotechnical conditions refers to any situation in which the use of a vibratory driver is insufficient to drive a pile to its required depth.

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SAR; www.nmfs.noaa.gov/pr/sars/) and more general information about these species (*e.g.*, physical and behavioral descriptions) may be found on NMFS's website (www.nmfs.noaa.gov/pr/species/mammals/).

Table 1 lists all species with expected potential for occurrence in Hood Canal and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. An expected potential was defined as species with any regular occurrence in Hood Canal since 1995. Note that while not observed on a consistent basis, west coast transient killer whales have been recorded intermittently in Hood Canal with the most recent sightings occurring in 2016 as described below. They have also been recorded remaining in the area for extended periods. As such, they have been listed as one of the species for which authorized take has been requested. For taxonomy, we follow Committee on Taxonomy (2017). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. All managed stocks in this region are assessed in NMFS's U.S.

Pacific Marine Mammal SARs (Carretta *et al.*, 2016) or Alaska Marine Mammal SARs (Muto *et al.*, 2016). All values presented in Table 1 are the most recent available at the time of publication and are available in the 2016 SARs (Carretta *et al.*, 2016, Muto *et al.*, 2016) (available online at: <http://www.nmfs.noaa.gov/pr/sars/species.htm>).

Table 1. Species Authorized for Take.

Species	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N) ¹	Stock abundance (CV, N _{min} , most recent abundance survey) ²	PBR	Annual M/SI ³
Order Cetartiodactyla – Cetacea – Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Killer whale	<i>Orcinus orca</i>	West coast transient	-; N	243 (n/a; 243, 2009) ⁴	2.4	0
Family Phocoenidae (porpoises)						
Harbor porpoise	<i>Phocoena phocoena vomerina</i>	Washington inland waters	-; N	11,233 (0.37; 8,308; 2015)	66	≥7.2
Order Carnivora – Superfamily Pinnipedia						
Family Otariidae (eared seals and sea lions)						
California sea lion	<i>Zalophus californianus</i>	U.S.	-; N	296,750 (n/a; 153,337; 2011)	9,200	389
Steller sea lion	<i>Eumetopias jubatus monteriensis</i>	Eastern U.S.	-; N	41,638 (n/a; 41,638; 2015)	2,498	108
Family Phocidae (earless seals)						
Harbor seal	<i>Phoca vitulina richardii</i>	Hood Canal	-; N	1,088 (0.15; unk; 1999) ⁴	unk	0.2

¹ Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

² NMFS marine mammal stock assessment reports online at: www.nmfs.noaa.gov/pr/sars/. CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance. In some cases, CV is not applicable.

³ These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.*, commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

⁴ Abundance estimates for these stocks are greater than eight years old and are therefore not considered current. PBR is considered undetermined for these stocks, as there is no current minimum abundance estimate for use in calculation. We nevertheless present the most recent abundance estimates, as these represent the best available information for use in this document.

A detailed description of the of the species likely to be affected by the SPE project, including brief introductions to the species and relevant stocks as well as available information regarding population trends and threats, and information regarding local occurrence, were provided in the **Federal Register** notice for the proposed IHA (83 FR 10689; March 12, 2018); since that time, we are not aware of any changes in the status of these species and stocks; therefore, detailed descriptions are not provided here. Please refer to that **Federal Register** notice for these descriptions. Please also refer to NMFS' website (www.nmfs.noaa.gov/pr/species/mammals/) for generalized species accounts.

Potential Effects of Specified Activities on Marine Mammals and their Habitat

The effects of underwater noise from pile driving and removal activities for the SPE project have the potential to result in behavioral harassment of marine mammals in the vicinity of the action area. The **Federal Register** notice for the proposed IHA (83 FR 10689; March 12, 2018) included a discussion of the effects of anthropogenic noise on marine mammals. The project would not result in permanent impacts to habitats used directly by marine mammals, such as haulout sites, but may have potential short-term impacts to food sources such as forage fish and minor impacts to the immediate substrate during installation and removal of piles during the SPE project. These potential effects are discussed in detail in the **Federal Register** notice for the proposed IHA (83 FR 10689; March 12, 2018) therefore that information is not repeated here; please refer to that **Federal Register** notice for that information.

Estimated Take

This section provides an estimate of the number of incidental takes authorization through this IHA, which informs both NMFS' consideration of whether the number of takes is "small" and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment, as pile driving has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result for the harbor seal, due to larger predicted auditory injury zones and regular presence around the waterfront area. Auditory injury is unlikely to occur for mid-frequency cetaceans, high frequency cetaceans or otariid species due to small predicted zones. The planned mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

As described previously, no serious injury or mortality is anticipated or authorized for this activity. Below we describe how the take is estimated.

Described in the most basic way, we estimate take by considering: 1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; 2) the area or volume of water that will be ensonified above these levels in a day; 3) the density or occurrence

of marine mammals within these ensonified areas; and, 4) and the number of days of activities. Below, we describe these components in more detail and present the authorized take estimate.

Acoustic Thresholds

NMFS uses acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (e.g., frequency, predictability, duty cycle), the environment (e.g., bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2011). NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally affected in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μ Pa (rms) for continuous (e.g. vibratory pile-driving) and above 160 dB re 1 μ Pa (rms) for non-explosive impulsive (e.g., impact pile driving).

Level A harassment – NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Technical Guidance, 2016) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources

(impulsive or non-impulsive). The Navy's planned activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving and extraction) sources.

These thresholds were developed by compiling and synthesizing the best available science and soliciting input multiple times from both the public and peer reviewers to inform the final product, and are provided in Table 2. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2016 Technical Guidance, which may be accessed at: <http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm>.

Table 2. Thresholds identifying the onset of Permanent Threshold Shift.

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	<i>Cell 1</i> $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	<i>Cell 2</i> $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	<i>Cell 3</i> $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	<i>Cell 4</i> $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	<i>Cell 5</i> $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	<i>Cell 6</i> $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	<i>Cell 7</i> $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	<i>Cell 8</i> $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	<i>Cell 9</i> $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	<i>Cell 10</i> $L_{E,OW,24h}$: 219 dB
<p>* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.</p> <p><u>Note:</u> Peak sound pressure (L_{pk}) has a reference value of 1 μPa, and cumulative sound exposure level (L_E) has a reference value of 1 μPa²s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.</p>		

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds.

Pile driving will generate underwater noise that potentially could result in disturbance to marine mammals swimming by the project area. Transmission loss (TL) underwater is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source until the source becomes indistinguishable from ambient sound. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. A standard sound propagation model, the Practical Spreading Loss model, was used to estimate the range from pile driving activity to various expected SPLs at potential project structures. This model follows a geometric propagation loss based on the distance from the driven pile, resulting in a 4.5 dB reduction in level for each doubling of distance from the source. In this model, the SPL at some distance away from the source (e.g., driven pile) is governed by a measured source level, minus the TL of the energy as it dissipates with distance. The TL equation is:

$$TL = 15 \log_{10}(R_1/R_2)$$

where

TL is the transmission loss in dB,

*R*₁ is the distance of the modeled SPL from the driven pile, and

*R*₂ is the distance from the driven pile of the initial measurement.

The degree to which underwater noise propagates away from a noise source is dependent on a variety of factors, most notably by the water bathymetry and presence or absence of reflective or absorptive conditions including the sea surface and sediment type. The TL model described above was used to calculate the expected noise propagation from both impact and vibratory pile

driving, using representative source levels to estimate the zone of influence (ZOI) or area exceeding the noise criteria.

Source Levels

For the analyses that follow, the TL model described above was used to calculate the expected noise propagation from pile driving, using an appropriate representative source level from Table 3 to estimate the area exceeding the noise criteria. The source levels were derived from the Navy's document titled *Proxy source sound levels and potential bubble curtain attenuation for acoustic modeling of nearshore marine pile driving at Navy installations in Puget Sound* (Navy 2015). In that document the Navy reviewed relevant data available for various types and sizes of piles typically used for pile driving and recommend proxy source values for Navy installations in Puget Sound. This document may be found as Appendix B in the Navy's application.

Table 3. Underwater Noise Source Levels Modeled for Impact and Vibratory Pile Driving.

Pile Type	Installation Method	Pile Diameter	RMS (dB re 1 μ Pa)	Peak (dB re 1 μ Pa)	SEL (dB re 1 μ Pa ² sec)
Timber	Vibratory	15-18 in (38- 45 cm)	155 ¹	N/A	N/A
Concrete	Impact	18 in (45 cm)	170	184	159
Steel	Impact	24 in (60 cm)	193	210	181
		36 (90 cm)	194	211	181
	Vibratory	24 (60 cm)	161	N/A	N/A
		36 (90 cm)	166	N/A	N/A

1. Navy opted to use conservative value of 155 dB for project

Key: cm = centimeter; dB re 1 μ Pa = decibels referenced at 1 micropascal; N/A = not applicable; RMS =

root mean square; SEL = sound exposure level.

For vibratory pile driving distances to the PTS thresholds, the TL model described above incorporated the auditory weighting functions for each hearing group using a single frequency as described in the NMFS Optional Spreadsheet (NMFS, 2016b). When NMFS' Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available. NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources, including pile driving, NMFS User Spreadsheet predicts the closest distance at which a marine mammal, if it remained beyond that distance the whole duration of the activity, would not incur PTS.

For impact pile driving distances to the cumulative PTS thresholds for 36-inch (90 cm) and 24-inch (60 cm) steel and concrete pile, the TL model described above incorporated frequency weighting adjustments by applying the auditory weighting function over the entire 1-second SEL spectral data sets from impact pile driving. The Navy believes, and NMFS concurs, that this methodology provides a closer estimate than applying the weighting function at a single frequency as suggested in the NMFS Spreadsheet. The NMFS Spreadsheet is considered to be a conservative method that typically results in higher estimates of the PTS onset distance from the

pile driving activity. The Navy analysis focused on the data provided from the Naval Kitsap Bangor Test Pile Program (steel piles) and the Puget Sound Naval Shipyard Intermediate Maintenance Facility Pier 6 Fender Pile Replacement Project (concrete piles) (Grebner *et al.*, 2016). This analysis is described in more detail in the Appendix in the application.

An unconfined bubble curtain will be used during impact driving of steel piles, since the project is located in an area without high currents. While bubble curtain performance is variable, data from the Bangor Naval Base Test Pile Program indicated an average peak SPL reduction of 8 dB to 10 dB at 10 meters was achieved for impact driving of 36- and 48-inch steel pipes (Navy 2015). However, for the SPE project, a reduction of 8 dB was utilized as shown in Table 4.

Table 4 – Inputs for Determining Distances to Cumulative PTS Thresholds.

INPUTS						
	36" Steel Impact	24" Steel Impact	18" Concrete Impact	24" Steel Vibratory	36" Steel Vibratory	Timber
Spreadsheet Tab Used	E.1-2) Impact pile driving	E.1-2) Impact pile driving	E.1-2) Impact pile driving	A.1) Vibratory pile driving	A.1) Vibratory pile driving	A.1) Vibratory pile driving
Source Level (Single Strike/shot SEL)	173 dB (assumes 8 dB attenuation)*	173 dB (assumes 8 dB attenuation)*	159 dB			
Source Level (RMS SPL)				161 dB	166 dB	155
Weighting Factor Adjustment (kHz)**	Weighting override (Grebner <i>et al.</i> 2016)	Weighting override (Grebner <i>et al.</i> 2016)	Weighting override (Grebner <i>et al.</i> 2016)	2.5	2.5	2.5
Number of strikes per day	1600	1600	1600			
Number of piles per day within 24-h period	2	1	3			
Duration of sound Production (minutes)				300	300	300
Propagation (xLogR)	15	15	15	15	15	15
Distance of source level measurement (meters)	10	10	10	10	10	10

* 8 dB reduction from use of unconfined bubble curtain during steel pipe impact driving.

**For impact driving, the TL model described above incorporated frequency weighting adjustments by applying the auditory weighting function over the entire 1-second SEL spectral data sets.

Table 5. Calculated Radial Distances (meters) to Underwater Marine Mammal Impact Pile Driving Noise Thresholds—SEL_{CUM} Isopleths.¹

Source Type	Level A Isopleths – Impact Driving ²			
	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
18-in concrete ³	2	74	19	1
24-in steel ⁴	5	253	34	2
36-in steel ⁴	14	740	217	12

Notes:

1. Calculations based on SEL_{CUM} threshold criteria shown in Table 4. Calculated values were rounded up the nearest meter.
2. Representative spectra were used to calculate the distances to the injury (PTS onset) thresholds for each functional hearing group for 24-inch and 36-inch steel pile and 24-inch (60 cm) concrete pile. Distances for 18-inch (45 cm) concrete piles assumed to be the same as 24-inch (60 cm) concrete piles.
3. No bubble curtain planned for concrete pile.
4. Bubble curtain will be used for 24-inch (60 cm) and 36-inch (90 cm) steel piles, and calculations include 8 dB attenuation

Table 6. Calculated Radial Distances (meters) to Level A Underwater Marine Mammal Vibratory Pile Driving Noise Isopleths.

Source Type	Level A Isopleths – Vibratory Driving ¹			
	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Otariid Pinnipeds
15-18-in timber	<1	12	5	<1
24-in steel	2	30	12	1
36-in steel	4	64	26	1.8

Notes:

1. Distances to the injury (PTS onset) thresholds calculated using National Marine Fisheries Service calculator with default Weighting Factor Adjustment of 2.5 (NMFS, 2016b). Calculated values were rounded up the nearest meter.

Tables 5 and 6 show the radial distances to impact and vibratory Level A isopleths.

Based on the dual criteria provided in the NMFS Spreadsheet, the cumulative SEL was selected over peak threshold to calculate injury thresholds because the ensonified distances were larger.

Using the same source level and transmission loss inputs discussed above the Level B isopleths were calculated for impact and vibratory driving (Table 7). Note that these attenuation

distances are based on sound characteristics in open water. The actual attenuation distances are constrained by numerous land features and islands; these actual distances are reflected in the ensonified areas given below.

Table 7 – Level B Impact and Vibratory Pile Driving Exposure Distances and Ensonified Areas.

Pile Type	Attenuation Distance	Area*
Impact (160 dB)		
18-in concrete	46 m	6.64 m ²
24-in steel	464 m	0.62 km ²
36-in steel	541 m	0.78 km ²
Vibratory (120 dB)		
15-18-in timber	2.2 km	6.8 km ²
24-in steel	5.4 km	26.1 km ²
36-in steel	11.7 km	49.6 km ²

* Areas were adjusted wherever land masses are encountered prior to reaching the full extent of the radius around the driven pile.

Marine Mammal Occurrence

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations.

Transient killer whales are rare in Hood Canal and there are few data to describe transient killer whale abundance within Hood Canal. There have been anecdotal accounts of the whales in Hood Canal for decades. There was a report from one day in April 2016 and eight days in May 2016 of whales in Dabob Bay in Hood Canal (Orca Network, 2016). It is not known if these sightings were all of the same group of transient killer whales. However, the temporally discontinuous data suggest a high degree of variability in the habitat use and localized relative

abundances of transient killer whales in Hood Canal. Given that whales were observed on eight days, in May 2016, NMFS will assume that whales could be observed on up to 8 days during the SPE project. The most commonly observed group size in Puget Sound from 2004 to 2010 was 6 whales (Navy 2017).

Harbor porpoises may be present in Puget Sound year-round typically in groups of one to five individuals and are regularly detected in Hood Canal. Aerial surveys conducted throughout 2013 to 2015 in Puget Sound indicated density in Puget Sound was 0.91 individuals/ km²) (95% CI=0.72-1.10, all seasons pooled) and density in Hood Canal was 0.47/km² (95% CI=0.29-0.75, all seasons pooled) (Jefferson *et al.*, 2016). However, after reviewing the most recent data the Navy has estimated that harbor porpoise density in Hood Canal is 0.44 animals/km² (Smultea *et al.*, 2017). Mean group size of harbor porpoises in Puget Sound in the 2013-2015 surveys was 1.7 in Hood Canal.

Steller sea lions are routinely seen hauled out on submarines at Naval Base Kitsap. The Navy relied on monitoring data from 2012 to 2016 to determine the average of the maximum count of hauled out Steller sea lions for each month in the in-water work window (Appendix A). The average of the monthly maximum counts during the in-water work window was 3.14.

California sea lions can occur at Naval Base Kitsap Bangor in any month, although numbers are low from June through August (Appendix A in the application).

California sea lions peak abundance occurs between October and May (NMFS, 1997; Jeffries *et al.*, 2000) but animals can occur at Naval Base Kitsap Bangor in any month. The Navy relied on monitoring data from 2012 to 2016 to determine the average of the maximum count of hauled out California sea lions for each month (Appendix A). The Navy determined abundance of California sea lions based on the average monthly maximum counts during the in-

water work window (Appendix A), respectively, for an average maximum count of 48.85 animals.

Boat-based surveys and monitoring indicate that harbor seals regularly swim in the waters at Naval Base Kitsap Bangor (Appendix A in Application). Hauled-out adults, mother/pup pairs, and neonates have been documented occasionally, but quantitative data are limited. Incidental surveys in August and September 2016 recorded as many as 28 harbor seals hauled out under Marginal Wharf or swimming in adjacent waters. Additional animals were likely present at other locations during the same time of the surveys. To be conservative, the Navy estimated that an additional 7 animals were present based on typical sightings at the other piers at Bangor. Therefore, the Navy and NMFS assume that up to 35 seals could occur near the SPE project area on any given day.

Take Calculation and Estimation

Here we describe how the information provided above is brought together to produce a quantitative take estimate.

To quantitatively assess exposure of marine mammals to noise levels from pile driving over the NMFS threshold guidance, one of three methods was used depending on the species spatial and temporal occurrence. For species with rare or infrequent occurrence during the in-water work window, the likelihood of occurrence was reviewed based on the information in Chapter 3 of the application and the potential maximum duration of work days and total work days. Only one species was in this category, transient killer whale, and it had the potential to linger for multiple days based on historical information. The calculation was:

$$(1) \text{ Exposure estimate} = \text{Probable abundance during construction} \times \text{Probable duration}$$

where:

Probable abundance = maximum expected group size

Probable duration = probable duration of animal(s) presence at construction sites during in-water work window

For species that regularly occur in Puget Sound, but for which local abundance data are not available, marine mammal density estimates were used when available to determine the number of animals potentially exposed in a ZOI on any one day of pile driving or extraction. Only harbor porpoise was in this category.

The equation for this species with only a density estimate and no site-specific abundance was:

$$(2) \text{ Exposure estimate} = N \times \text{ZOI} \times \text{maximum days of pile driving}$$

where:

N = density estimate used for each species

ZOI = Zone of Influence; the area where noise exceeds the noise threshold value

For species with site-specific surveys available, exposures were estimated by:

$$(3) \text{ Exposure estimate} = \text{Abundance} \times \text{maximum days of pile driving}$$

where

Abundance = average monthly maximum over the time period when pile driving will occur for sea lions, and estimated total abundance for harbor seals

All three pinniped species were in this category. Average monthly maximum counts of Steller sea lions and California sea lions (see Appendix A for abundance data of these species) were averaged over the in- water work window. The maximum number of animals observed during the month(s) with the highest number of animals present on a survey day was used in the analysis. For harbor seals, an abundance estimate for the Bangor waterfront was used.

The following assumptions were used to calculate potential exposures to impact and vibratory pile driving noise for each threshold.

- For formulas (2) and (3), each species will be assumed to be present in the project area each day during construction. The timeframe for takings would be one potential take (Level B harassment exposure) per individual, per 24 hours.

- The pile type, size, and installation method that produce the largest ZOI were used to estimate exposure of marine mammals to noise impacts. Vibratory installation of 36-inch (90 cm) steel piles created the largest ZOI, so the exposure analysis calculates marine mammal exposures based on 36-inch steel piles for the 125 days when steel piles would be installed. For the estimated 35 days when concrete fender piles would be installed, impact driving was the only installation method and only 18-inch piles were proposed, so the exposure analysis calculated marine mammal exposures based on impact driving 18-inch concrete piles.

- All pilings will have an underwater noise disturbance distance equal to the pile that causes the greatest noise disturbance (*i.e.*, the piling farthest from shore) installed with the method that has the largest ZOI. If vibratory pile driving would occur, the largest ZOI will be produced by vibratory driving. In this case, the ZOI for an impact hammer will be encompassed by the larger ZOI from the vibratory driver. Vibratory driving was assumed to occur on all 125 days of steel pile driving, but not the 35 days of concrete fender pile installation.

- Days of pile driving were conservatively based on a relatively slow daily production rate, but actual daily production rates may be higher, resulting in fewer actual pile driving days. The pile driving days are used solely to assess the number of days during which pile driving could occur if production was delayed due to equipment failure, safety, etc. In a real construction situation, pile driving production rates would be maximized when possible.

Transient Killer Whale

Using the first calculation described in the above section, exposures to underwater pile driving were calculated using the average group size times the 8 days transient killer whales would be anticipated in the Hood Canal during pile driving activities. The Navy assumed that the average pod size was six individuals.

Using this rationale, 48 potential Level B exposures of transient killer whales from vibratory pile driving are estimated (six animals times 8 days of exposure). Based on this analysis, the Navy requested and NMFS has authorized 48 Level B incidental takes for behavioral harassment. Concrete and steel ZOIs from impact driving will be fully monitorable (maximum distances to behavioral thresholds of 46 m and 541 m, respectively, and maximum distance to injury thresholds is 14 m), so no killer whale behavioral or injury takes are expected from impact driving.

Harbor Porpoise

Applying formula (2) to the animal density (0.44 animals/ km²), the largest ZOI for Level B exposure (49.6 km²) and the estimated days of steel pile driving (125), the Navy requested and NMFS has authorized 2,728 Level B incidental takes of harbor porpoises. The 49.6 km² ZOI excludes the area behind the PSB because harbor porpoise have never been observed within the barrier. Harbor porpoise can be visually detected to a distance of about 200 m by experienced observers in conditions up to Beaufort 2 (Navy 2017). Therefore, the concrete ZOIs will be fully monitorable (maximum distance of 46 m), so no takes were calculated for the estimated 35 days of concrete fender pile installation.

Steller Sea Lion

Formula (3) as described in the previous section was used with site-specific abundance data to calculate potential exposures of Steller sea lions during steel pile driving for the SPE project. Animals could be exposed when traveling, resting, and foraging. Because a Level A injury shut-down zone will be implemented, Level A harassment is not expected to occur.

The Navy conservatively assumes that any Steller sea lion that hauls out at Bangor could swim into the behavioral harassment zone each day during pile driving because this zone extends across Hood Canal and up to 11.7 km from the driven pile. The Navy estimated 3.14 animals could be exposed to harassment per day. These values provide a worst case assumption that on all 125 days of pile driving, all animals would be in the water each day during pile driving. Applying formula (3) to this abundance and the 125 steel pile driving days, the Navy requested and NMFS authorized the take of up to 393 Steller sea lions. If project work occurs during months when Steller sea lions are less likely to be present, actual exposures would be less. Additionally, if daily pile driving duration is short, exposure would be expected to be less because some animals would remain hauled out for the duration of pile driving. With a shutdown zone of 15 meters, Level B take is also anticipated to occur during 35 days of concrete fender pile installation. NMFS assumed that 3.14 animals would be exposed per day in the small Level B zone associated with impact driving of concrete piles resulting in 110 takes. Any exposure of Steller sea lions to pile driving noise will be minimized to short-term behavioral harassment. Therefore, NMFS has authorized the Level B take of 503 Steller sea lions.

California Sea Lion

Formula (3) was used with site-specific abundance data to calculate potential exposures of California sea lions during pile driving for the SPE project. Because a Level A injury shut-down zone will be implemented, no exposure to Level A noise levels will occur at any location.

Based on site-specific data regarding the average maximum counts, the Navy assumes that 48.85 exposures per day could occur over 125 planned steel pile driving days resulting in 6,106 exposures. With a shutdown zone of 15 meters, Level B take is also anticipated to occur during 35 days of concrete fender pile installation. NMFS assumed that 48.85 animals would be exposed per day in the small Level B zone associated with impact driving of concrete piles resulting in 1,710 takes. Any exposure of Steller sea lions to pile driving noise will be minimized to short-term behavioral harassment. Therefore, NMFS has authorized 7,816 Level B takes.

Harbor Seal

The Navy calculated up to 35 harbor seals may be present per day during summer and early fall months. Exposure of harbor seals to pile driving noise will be primarily in the form of short-term behavioral harassment (Level B) during steel and concrete pile driving. Formula (3) was used with site-specific abundance data to calculate potential exposures of harbor seals due to pile driving for the SPE.

The Navy assumes that any harbor seal that hauls out at Bangor could swim into the behavioral harassment zone each day during impact pile driving. The largest ZOI for behavioral disturbance (Level B) would be 11.7 km for vibratory driving and extraction of 36-inch steel piles. Applying formula (3) to the abundance of this species (35 individuals) and the 125 pile driving days, results in 4,375 takes Level B takes. With a shutdown zone of 35 meters Level B take is also anticipated to occur during 35 days of concrete fender pile installation. NMFS assumed that 35 animals would be exposed per day in the small Level B zone associated with impact driving of concrete piles resulting in 1,225 takes.

The largest ZOI for Level A injury will be 217 m for impact driving (with bubble curtain) of 36-inch steel piles. A monitors' ability to observe the entire 217 m injury zone may be difficult because construction barges and the current Service Pier structure and associated mooring floats and vessels will interfere with a monitors' ability to observe the entire injury zone. Some individuals could enter, and remain in, the injury zone undetected by monitors, resulting in potential PTS. It is assumed that one of the 35 individuals present on the Bangor waterfront would enter, and remain in, the injury zone without being detected by marine mammal monitors each day during steel impact driving. Therefore, with 125 steel pile driving days and one individual per day being exposed to Level A noise levels, 125 Level A takes of harbor seals are authorized by NMFS. With a shutdown zone of 35 meters Level B take is also anticipated to occur during 35 days of concrete fender pile installation. NMFS assumed that 35 animals would be exposed per day in the small Level B zone associated with impact driving of concrete piles resulting in an additional 1,225 Level B takes. Therefore, NMFS has authorized 5,600 Level B takes

It should be noted that Level A takes of harbor seals would likely be multiple exposures of the same individuals, rather than single exposures of unique individuals. This request overestimates the likely Level A exposures because: (1) seals are unlikely to remain in the Level A zone underwater long enough to accumulate sufficient exposure to noise resulting in PTS, and (2) the estimate assumes that new seals are in the Level A ZOI every day during pile driving. No Level A takes are requested for vibratory pile driving because the maximum harbor seal injury zone is 26 m and is within a practicable shutdown distance. It is important to note that the estimate of potential Level A harassment of harbor seals is expected to be an overestimate, since

the planned project is not expected to occur near Marginal Wharf—the location where most harbor seal activity occurs.

Table 8 provides a summary of authorized Level A and Level B takes as well as the percentage of a stock or population authorized for take.

Table 8. Authorized Take and Percentage of Stock or Population.

Species	Authorized Take		% population
	Level A	Level B	
Killer whale	0	48	19.7
Harbor porpoise	0	2,728	24.3
Steller sea lion	0	503	1.2
California sea lion	0	7,816	2.6
Harbor seal	125	5,600	n/a

Mitigation

In order to issue an IHA under Section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

1) the manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned) the likelihood of effective implementation (probability implemented as planned) and;

2) the practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In addition to the specific measures described later in this section, the Navy would conduct briefings between construction supervisors and crews, marine mammal monitoring team, and Navy staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.

Use of Vibratory Installation —The Navy will employ vibratory installation to the greatest extent possible when driving steel piles to minimize high sound pressure levels associated with impact pile driving. Impact driving of steel piles will only occur when required by geotechnical conditions or to “proof” load-bearing piles driven by vibratory methods.

Timing Restrictions — To minimize the number of fish exposed to underwater noise and other construction disturbance, in-water work will occur during the in-water work window previously described when ESA-listed salmonids are least likely to be present (USACE, 2015), July 16–January 15.

All in-water construction activities will occur during daylight hours (sunrise to sunset) except from July 16 to September 15, when impact pile driving will only occur starting 2 hours after sunrise and ending 2 hours before sunset, to protect foraging marbled murrelets during the nesting season (April 15–September 23). Sunrise and sunset are to be determined based on National Oceanic and Atmospheric Administration data, which can be found at <http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html>.

Use of Bubble Curtain—A bubble curtain will be employed during impact installation or proofing of steel piles where water depths are greater than 0.67 m (2 ft). A noise attenuation device is not required during vibratory pile driving. If a bubble curtain or similar measure is used, it will distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column. Any other attenuation measure must provide 100 percent coverage in the water column for the full depth of the pile. The lowest bubble ring shall be in contact with the mudline for the full circumference of the ring. The weights attached to the bottom ring shall ensure 100 percent mudline contact. No parts of the ring or other objects shall prevent full mudline contact.

A performance test of the bubble curtain shall be conducted prior to initial use for impact pile driving. The performance test shall confirm the calculated pressures and flow rates at each manifold ring. The contractor shall also train personnel in the proper balancing of air flow to the bubblers. The contractor shall submit an inspection/performance report to the Navy for approval.

within 72 hours following the performance test. Corrections to the noise attenuation device to meet the performance stands shall occur prior to use for impact driving.

Soft-Start—The use of a soft start procedure is believed to provide additional protection to marine mammals by warning or providing a chance to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a 30 second waiting period, then two subsequent reduced energy strike sets. (The reduced energy of an individual hammer cannot be quantified because it varies by individual drivers. Also, the number of strikes will vary at reduced energy because raising the hammer at less than full power and then releasing it results in the hammer “bouncing” as it strikes the pile, resulting in multiple “strikes.”)

A soft-start procedure will be used for impact pile driving at the beginning of each day’s in-water pile driving or any time impact pile driving has ceased for more than 30 minutes.

Establishment of Shutdown Zones and Disturbance Zones—For all impact and vibratory pile driving of steel piles, shutdown and disturbance zones will be established and monitored. The Navy will focus observations within 1,000 m for all species during these activities but will record all observations. During impact driving of concrete piles the Navy will focus on monitoring within 100 m but will record all observations. The Navy will monitor and record marine mammal observations within zones and extrapolate these values across the entirety of the Level B zone as part of the final monitoring report. To the extent possible, the Navy will record and report on any marine mammal occurrences, including behavioral disturbances, beyond 1,000 m for steel pile installation and 100 m for concrete pile installation.

The shutdown zones are based on the distances from the source predicted for each threshold level. Although different functional hearing groups of cetaceans and pinnipeds were

evaluated, the threshold levels used to develop the disturbance zones were selected to be conservative for cetaceans (and therefore at the lowest levels); as such, the disturbance zones for cetaceans were based on the high frequency threshold (harbor porpoise). The shutdown zones are based on the maximum calculated Level A radius for pinnipeds and cetaceans during installation of 36-inch steel and concrete piles with impact techniques, as well as during vibratory pile installation and removal. These actions serve to protect marine mammals, allow for practical implementation of the Navy's marine mammal monitoring plan and reduce the risk of a take. The shutdown zone during any non-pile driving activity will always be a minimum of 10 m (33 ft) to prevent injury from physical interaction of marine mammals with construction equipment. Note that in the notice of proposed IHA (83 FR 10689: March 12, 2018), the Navy had requested and NMFS proposed larger shutdown zones than those authorized as depicted below. The shutdown zones were reduced to more closely align with the Level A isopleths shown in Tables 5 and 6. Reducing zone size should minimize shutdown occurrences caused by entry of animals into Level A zones. Excessive shutdowns caused by the originally proposed zones could negatively affect SPE project schedule without decreasing the risk of auditory injury to marine mammals.

During all pile driving, the shutdown, Level A, and Level B zones as shown in Tables 9, 10, and 11 will be monitored out to the greatest extent possible with a focus on monitoring within 1,000 m for steel pile and 100 m for concrete pile installation.

For steel pile impact pile driving, monitors would initiate shutdown when harbor seals approach or enter the zone. However, because of the size of the zone and the inherent difficulty in monitoring harbor seals, a highly mobile species, it may not be practical, which is why Level A take is requested.

The isopleths delineating shutdown, Level A, and Level B zones during impact driving of all steel piles are shown in Table 10. Note that the Level A isopleth is larger than the Level B isopleth for harbor porpoises.

Table 9. Shutdown, Level A, and Level B Isopleths during Impact Driving of Steel Piles.

<i>Marine Mammal Group</i>	<i>Level B Isopleth</i>	<i>Level A Isopleth</i>	<i>Shutdown Zone</i>
Cetaceans	541 meters	740 meters	750 meters
Harbor Seal	541 meters	217 meters	220 meters
Sea Lions	541 meters	12 meters	15 meters

The isopleths for the shutdown, Level A, and Level B zones during vibratory driving of all steel piles are shown in Table 11.

Table 10. Shutdown, Level A, Level B Isopleths during Vibratory Driving of Steel Piles

<i>Marine Mammal Group</i>	<i>Level B Isopleth</i>	<i>Level A Isopleth</i>	<i>Shutdown Zone</i>
Cetaceans	11,700 meters	64 meters	100 meters
Harbor Seal	11,700 meters	26 meters	30 meters
Sea Lions	11,700 meters	12 meters	15 meters

The shutdown, Level A, and Level B isopleths for implementation during impact driving of concrete piles are shown in Table 11. Given that the shutdown zone for all authorized species is larger than the Level A and Level B isopleths there should be no take recorded during concrete pile driving.

Table 11. Shutdown, Level A, and Level B Isopleths during Impact Driving of Concrete Piles

<i>Marine Mammal Group</i>	<i>Level B Isopleth</i>	<i>Level A Isopleth</i>	<i>Shutdown Zone</i>
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Cetaceans	46 meters	74 meters	100 meters
Harbor Seal	46 meters	19 meters	35 meters
Sea Lions	46 meters	1 meter	15 meters

Note that the radii of the disturbance zones may be adjusted if in-situ acoustic monitoring is conducted by the Navy to establish actual distances to the thresholds for a specific pile type and installation method. However, any planned acoustical monitoring plan must be pre-approved by NMFS. The results of any acoustic monitoring plan must be reviewed and approved by NMFS before the radii of any disturbance zones may be revised.

The mitigation measures described above should reduce marine mammals' potential exposure to underwater noise levels which could result in injury or behavioral harassment. Based on our evaluation of the applicant's planned measures, as well as other measures considered by NMFS, NMFS has determined that the planned mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth, requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the planned action

area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Visual Monitoring

Marine mammal monitoring will include the following requirements.

Marine Mammal Observers (MMOs) will be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations. During pile driving, one

MMO will be stationed in a vessel, and at least four will be stationed on the pier, along the shore, or on the pile driving barge to maximize observation coverage. Each MMO location will have a minimum of one dedicated MMO (not including boat operators). There will be 3-5 MMOs working depending on the location, site accessibility and line of sight for adequate coverage.

Additional standards required for visual monitoring include:

- (a) Independent observers (*i.e.*, not construction personal) are required;
- (b) At least one observer must have prior experience working as an observer;
- (c) Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience;
- (d) Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer; and

Monitoring will be conducted by qualified observers, who will monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. Qualified observers are trained biologists, with the following minimum qualifications:

- (a) Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;
- (b) Advanced education in biological science or related field (undergraduate degree or higher required);
- (c) Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience);

(d) Experience or training in the field identification of marine mammals, including the identification of behaviors;

(e) Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;

(f) Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior; and

(g) Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

MMOs will survey the disturbance zone 15 minutes prior to initiation of pile driving through 30 minutes after completion of pile driving to ensure there are no marine mammals present. A determination that the shutdown zone is clear must be made during a period of good visibility (*i.e.*, the entire shutdown zone and surrounding waters must be visible to the naked eye). Marine Mammal Observation Record forms (Appendix A of the application) will be used to document observations. Survey boats engaged in marine mammal monitoring will maintain speeds equal to or less than 10 knots.

MMOs will use binoculars and the naked eye to search continuously for marine mammals and will have a means to communicate with each other to discuss relevant marine mammal information (e.g., animal sighted but submerged with direction of last sighting). MMOs will have the ability to correctly measure or estimate the animals distance to the pile driving equipment such that records of any takes are accurate relevant to the pile size and type.

Shutdown shall occur if a species for which authorization has not been granted or for which the authorized numbers of takes have been met. The Navy shall then contact NMFS within 24 hours.

If marine mammal(s) are present within or approaching a shutdown zone prior to pile driving, the start of these activities will be delayed until the animal(s) have left the zone voluntarily and have been visually confirmed beyond the shutdown zone, or 15 minutes has elapsed without re-detection of the animal.

If animal is observed within or entering the Level B zone during pile driving, a take would be recorded, behaviors documented. However, that pile segment would be completed without cessation, unless the animal approaches or enters the shutdown Zone, at which point all pile driving activities will be halted. The MMOs shall immediately radio to alert the monitoring coordinator/construction contractor. This action will require an immediate “all-stop” on pile operations. Once a shutdown has been initiated, pile driving will be delayed until the animal has voluntarily left the Shutdown Zone and has been visually confirmed beyond the Shutdown Zone, or 15 minutes have passed without re-detection of the animal (*i.e.*, the zone is deemed clear of marine mammals).

All marine mammals observed within the disturbance zones during pile driving activities will be recorded by MMOs. These animals will be documented as Level A or Level B takes as appropriate. Additionally, all shutdowns shall be recorded. For vibratory driving activities, this data will be extrapolated across the full extent of the Level B ensonified zone (*i.e.* 11.7 km radii) to provide total estimated take numbers.

A draft marine mammal monitoring report would be submitted to NMFS within 90 days after the completion of pile driving and removal activities. It will include an overall description

of work completed, a narrative regarding marine mammal sightings, and associated marine mammal observation data sheets. Specifically, the report must include information as described in the Marine Mammal Monitoring Report (Appendix D of the application).

If no comments are received from NMFS within 30 days, the draft final report will constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

In the unanticipated event that: 1) the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA (if issued), such as an injury, serious injury or mortality; 2) an injured or dead animal is discovered and cause of death is known; or 3) an injured or dead animal is discovered and cause of death is not related to the authorized activities, the Navy will follow the protocols described in the Section 3 of Marine Mammal Monitoring Report (Appendix D of the application). Additionally, the Navy will report any pinniped hauled out at unusual sites (*e.g.*, in work boats) to the local stranding network and to NMFS, and follow any procedures or measures stipulated by the stranding network.

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the

context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

Pile driving and extraction associated with the Navy SPE project as outlined previously have the potential to injure, disturb or displace marine mammals. Specifically, the specified activities may result in Level B harassment (behavioral disturbance) for five marine mammal species authorized for take from underwater sound generated during pile driving operations. Level A harassment in the form of PTS may also occur to limited numbers of one species. Level A harassment was conservatively authorized for harbor seals since seals can occur in high numbers near the project area, can be difficult to spot, and MMO's ability to observe the entire 217 m injury zone may be slightly impaired because of construction barges and vessels. Potential takes could occur if marine mammals are present in the Level A or Level B ensonified zones when pile driving and removal occurs.

No serious injury or mortality is anticipated given the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for injury is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory driving will be the primary method of installation. This driving method decreases the potential for injury due to relatively low source levels and

lack of potentially injurious source characteristics. Only piles that cannot be driven to their desired depths using the vibratory hammer will be impact driven for the remainder of their required driving depth. Noise attenuating devices (*i.e.*, bubble curtain) will be used during impact hammer operations for steel piles. During impact driving, implementation of soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient “notice” through use of soft start (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious. Given the number of MMOs that will be employed, observers should have a relatively clear view of the shutdown zones, although under limited circumstances the presence of barges and vessels may impair observation of small portions of shutdown zones. This will enable a high rate of success in implementation of shutdowns to avoid injury.

The Navy's planned activities are highly localized. Only a relatively small portion of Hood Canal may be affected. The project is not expected to have significant adverse effects on marine mammal habitat. No important feeding and/or reproductive areas for marine mammals are known to be near the project area. Impacts to salmonid and forage fish populations, including ESA-listed species, will be minimized by adhering to the designated in-water work period. Project-related activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range, but because of the relatively small area of the habitat range utilized by each species that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

Exposures to elevated sound levels produced during pile driving activities may cause behavioral responses by an animal, but they are expected to be mild and temporary. Effects on

individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff, 2006; Lerma, 2014). Most likely, individuals will simply move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving. These reactions and behavioral changes are expected to subside quickly when the exposures cease. The pile driving activities analyzed here are similar to, or less impactful than, numerous construction activities conducted in other similar locations including Hood Canal, which have taken place with no reported injuries or mortality to marine mammals, and no known long-term adverse consequences from behavioral harassment. Repeated exposures of individuals to levels of sound that may cause Level B harassment are unlikely to result in permanent hearing impairment or to significantly disrupt foraging behavior. Level B harassment will be reduced through use of mitigation measures described herein.

In summary and as described above, the following factors primarily support our determination that the impacts resulting from this activity are not expected to adversely affect the species or stocks through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or authorized;
- The area of potential impacts is highly localized;
- No adverse impacts to marine mammal habitat;
- The absence of any significant habitat within the project area, including rookeries, or known areas or features of special significance for foraging or reproduction;

- Anticipated incidences of Level A harassment would be in the form of a small degree of PTS to a limited number of animals from one species;
- Anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior;
- The anticipated efficacy of the required mitigation measures in reducing the effects of the specified activity.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the planned monitoring and mitigation measures, NMFS finds that the total marine mammal take from the planned activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under Section 101(a)(5)(D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Table 8 depicts the number of animals that could be exposed to Level A and Level B harassment from work associated with the SPE project. With the exception of harbor seals, the analysis provided indicates that authorized takes account for no more than 24.3 percent of the

populations of the stocks that could be affected. These are small numbers of marine mammals relative to the sizes of the affected species and population stocks under consideration.

For the affected stock of harbor seals, no valid abundance estimate is available. The most recent abundance estimates for harbor seals in Washington inland waters are from 1999, and it is generally believed that harbor seal populations have increased significantly during the intervening years (e.g., Mapes, 2013). However, we anticipate that takes estimated to occur for harbor seals are likely to occur only within some portion of the relevant populations, rather than to animals from the stock as a whole. For example, takes anticipated to occur at NBK Bangor would be expected to accrue to the same individual seals that routinely occur on haulouts at these locations, rather than occurring to new seals on each construction day. In summary, harbor seals taken as a result of the specified activities are expected to comprise only a limited portion of individuals comprising the overall relevant stock abundance. Therefore, we find that small numbers of marine mammals will be taken relative to the population size of the Hood Canal stock of harbor seal.

Based on the analysis contained herein of the planned activity (including the planned mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our proposed action (*i.e.*, the issuance of an incidental harassment authorization) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in CE B4 of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has determined that the issuance of the IHA qualifies to be categorically excluded from further NEPA review and signed a Categorical Exclusion memo in June 2018.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

No incidental take of ESA-listed species is planned for authorization or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

Authorization

NMFS has issued an IHA to the Navy for the potential harassment of small numbers of five marine mammal species incidental to the Service Pier Extension project at Naval Base

Kitsap Bangor provided the previously mentioned mitigation, monitoring and reporting requirements are incorporated.

Dated: June 22, 2018.

Elaine T. Saiz,

Acting Deputy Director,

Office of Protected Resources,

National Marine Fisheries Service.

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